


project WEB

Fall
2005

Connecting Projects WILD, WET and Learning Tree in New Hampshire

Make Way for Winter

It's nearly winter, a time when most of us are readying ourselves, our families and our homes for the long, cold, snowy months ahead. We make sure our cars have enough antifreeze and are stocked with plenty of dry gas, warm blankets and a shovel. We clean the furnaces and chimneys in our homes and buy fuel to keep us warm throughout the winter. Many of us stock the cupboards with a selection of hearty soups and stews and hot chocolate to fuel and refresh us after a day in the cold.

We know what we have to do to prepare for and survive a northern winter, but what do plants and animals do to survive? Your students have no doubt wondered how the animals keep warm without a heated house to live in; how the plants seem to die in the fall, then surge to life again in the spring; or how frogs can survive in the mud without freezing. Take advantage of your students' natural curiosity and the unique opportunity winter brings to explore the special adaptations both plants and wildlife have to enable them to survive. 

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"How many rivets can a Boeing 747 lose before it crashes?"

*(Extracted from the convention on biological diversity; Government de Quebec)
The same question is raised concerning the importance of protecting biological diversity.*



Winter in New Hampshire

by Dr. Peter Crane, Mount Washington Observatory
Director of Programs

Though a small state, New Hampshire has winter weather that can vary widely depending on where you are. The Seacoast area is likely to see a moderating influence from the Atlantic; cold air from Canada can have more of an effect in the far north. Mountain areas, from the White Mountains to the Monadnock region, can see storm impacts enhanced by altitude.

Even with local variations, winter in the Granite State is typically characterized by cold days and nights, with significant snowfalls possible from November into April. Usually, the prevailing influence is cold, dry air from the west or northwest. With the region's legendary climatic variability, at times milder, more humid southern air can infiltrate even in mid-winter. In spite of the proximity of the Atlantic Ocean, the maritime influence is limited, with snow-laden "Nor'easter" storms an occasional, but noteworthy occurrence, troubling highway crews and gladdening skiers and other outdoor enthusiasts. In Concord, overnight lows average in the singles and teens F., with typical daytime highs near the thawing mark. About 2 to 3 inches of precipitation, including 12 to 18 inches of snow, fall in a typical winter month in Concord; most snow falls from December into March.

New Hampshire also has world-class extreme



Mount Washington

winter weather on Mount Washington, at 6,288 feet the highest peak in the state and in the northeastern U.S. The mountaintop claims the coldest official temperature in the state (-47° F), as well as the world record surface wind of 231 miles per hour (clocked in April 1934). The mountain's record snow year yielded more than 47 feet of snow. Average mid-winter conditions see temperatures range from a few degrees below zero to the low teens, with winds about 46 miles per hour and hurricane force gusts commonplace. An average winter month gives about 4 feet of new snow. Mount Washington's weather is severe enough that some mountaineers preparing to tackle Alaska's Mount McKinley, the highest peak in North America, practice on its slopes.



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New Hampshire
Fish and Game
Department

Energy Conservation Key to Deer Survival



White-tailed deer

Many New Hampshire mammals remain active throughout the winter. Since less food is available in winter, the key to survival for most mammals is the conservation of energy. One of the biggest drains on an animal's energy is the need to maintain a constant warm body temperature. When we run out of the wood or oil we use to heat our homes, we can make a call and order a delivery. When animals run out of fuel, either in the form of stored fat, like deer; or in combinations of stored fat and food caches, like beaver, there is a good chance that animal

will starve to death unless spring's warmth and new green shoots are very near at hand. Conservation of heat is so critical to an animal's survival that most have evolved both physiological and behavioral adaptations that enable them to maintain their body temperature with a minimal drain on their energy reserves.

White-tailed deer are mammals with many adaptations that allow them to survive through most of what a New Hampshire winter can dish out. The deer's winter pelage, or coat, is very dense, with guard hairs up to five centimeters in length. The hairs are stiff, hollow and wavy, which makes them good at trapping the warm air near the body. Deer can help regulate their own temperature in several ways. They can change their posture; lying out of the wind, for example, keeps a deer warmer than standing up in it. Deer can make their hair become erect, which increases its insulating effect. Using bedding sites on sun-facing slopes also conserves energy. In addition, deer can shiver, generating heat by working skeletal muscles.

Deer, like many other mammals and birds, have a counter current heat exchange system in their legs to help conserve heat. The

arteries that carry warm blood from the heart to the feet are very close to the veins that bring cooled blood from the feet back to the heart. This proximity allows the blood returning to the heart to be warmed along the way by the warm blood passing by on its way to the feet.

Deer also conserve energy by congregating in winter, or yarding, in areas of dense spruce and fir growth. Dense branches collect snow and limit the amount of snow that falls to the ground. The area under the trees with less snow is easier for deer to walk in than open areas where snow is deeper. Snow-laden branches also provide protection from the wind and trap heat radiating from the earth at night.



Winter, Weather and White-tailed Deer is a curriculum unit that allows your middle school students to help collect data for determining the annual Winter Severity Index, a tool biologists use to estimate the effects of cold, snowy winter conditions on New Hampshire's deer populations. To get involved, contact Mary Goodyear at mgoody@ncia.net or at (603) 846-5108.

Trees Adapt to Winter, Too

While animals cope with winter by changing their behavior or location, trees, of course, cannot. Instead they rely on physiological and structural adaptations to survive the cold and drying conditions of winter. Trees use four basic strategies to survive winter:

Leaf drop or adaptations for leaf and needle retention: Deciduous trees, mostly the broadleaf trees, drop their leaves to avoid the problem of maintaining foliage. In contrast, evergreens, mostly the needled conifers, keep their foliage through the winter by controlling the movement of air and water through their needles' stomates (openings in a leaf through which gases and water enter or leave) or by being covered with a waxy coating called "cutin."

Physiological acclimatization: All trees undergo an acclimatization process. Like leaf drop, the process is initiated by changes in photoperiod and is controlled by hormones and other chemicals. The process occurs at the cellular level and exploits the

physical properties of water, effectively changing the cells' temperature and also the temperature at which the cells will die.

Minimizing water loss: The bark and buds of deciduous trees are fairly watertight, but because evergreens keep their foliage, they photosynthesize when the temperature rises and the sun shines. When this happens, water is needed. Although water can be obtained from the ground, within the tree or from the subnivean (under snow) micro-environment, minimizing water loss is important. Stomate control and cutin are two adaptations for this.

Methods of reducing mechanical damage: Snow and ice accumulation can cause breakage, especially under windy conditions. Conifers have growth patterns that minimize the chances of damage. For example, their conical shape effectively sheds snow and their long wood fibers are flexible, allowing the branches to bend under the heavy weight of snow.



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Adapted from the Michigan Forever Teacher's Guide (Michigan State University Extension) at www.dsisd.k12.mi.us/mff/Environment/WinterTrees.htm; submitted by Karen Bennett, UNH Cooperative Extension Forestry Specialist. Questions welcome at karen.bennett@unh.edu or (603) 862-4861.



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Spotlight on...

The Mount Washington Observatory

Sharing science and research with teachers and students in New Hampshire

The Mount Washington Observatory is a private, nonprofit, membership-supported organization that has maintained a weather station and scientific research facility atop New Hampshire's highest peak since 1932.



Mount Washington Observatory

The observatory has three main areas of activity. It is involved in environmental monitoring, principally through its hourly weather observations, but also in other projects such as air quality assessment. It is engaged in scientific research, including fields like atmospheric physics and the practical testing of weather equipment. The observatory also is involved in many educational activities, including its summit museum, its Weather Discovery Center in North Conway, overnight programs at the summit in summer and winter, school and other public outreach presentations, an informative website www.mountwashington.org and a nationally distributed radio program, *The Weather Notebook*.

From its beginning, the observatory has offered many services to the residents of New Hampshire. Weather information from the summit helps create a forecast for the region, and long-term data aids in understanding our area's changing climate. Weather and other mountain information, disseminated through the observatory website and in other ways, assists hikers, climbers, skiers and other visitors to the Granite State. Thanks to their on-going presence on Mount Washington, observatory

Mount Washington Observatory Outreach Programs

Observatory staff always look forward to sharing their knowledge and experiences with teachers and students through outreach presentations.

Programs can focus on topics such as the basics of weather, life on Mount Washington and weather observations. Presentations are available at your school or at the Weather Discovery Center in North Conway. Special teacher-training programs are also offered. For more information, write to outreach@mountwashington.org, or call (603) 356-2137 x 225.

staff sometimes assist injured or lost hikers whose adventures have led them astray. The observatory's educational programs help inform New Hampshire students about weather science and outdoor safety.



BRRRRR...Chirp! It's Cold!

Some birds cope with the cold by migrating south to warmer territory, but not all birds leave New Hampshire in the winter. Those that stay have to deal with the cold. How do they manage? One simple way birds stay warm is by fluffing out their feathers. The fluffing creates spaces between the feathers where air is trapped. The trapped air insulates the bird's body from the cold. You might have noticed the puffed-out breast feathers covering the legs and feet of some birds, like sparrows, juncos and finches, when they sit and feed off the ground.

Some birds, like titmice, huddle together to stay warm. To lessen heat loss, many birds have arteries and veins in their legs that touch each other and exchange heat. Warm blood flowing toward the feet passes heat to the blood flowing back

to the body. Blood vessels near the surface of the feet constrict and become smaller. That lets just enough blood reach the feet to keep them healthy, but exposes less blood to the cold. So, while the core temperature of a duck standing on ice may be 104° F, the temperature of its feet may be only slightly above freezing.

Because birds lose heat each time they breathe, sleeping birds may tuck their bills under their shoulder feathers to save heat. Shorebirds and other birds that wade in water on long legs, save body heat by sleeping while standing on one leg. The other leg, tucked up close against the body, helps keep them warm.

Like humans, birds shiver, and the heat produced by shivering muscles helps keep



© USFWS DONNA DEWHURST PHOTO

Snow bunting

their bodies warm. Shivering takes energy, and birds need lots of energy to stay warm in winter. Their energy, like yours, comes from food. The more food a bird eats, the warmer it will be. Seeds are a good source of energy for birds like chickadees and juncos, while mice are food for hawks and owls. Because food is harder to find, birds must spend more time feeding in winter than in summer.



How Do Reptiles and Amphibians Survive Winter?

by Michael Marchand, Wetland Systems
Biologist, Nongame and Endangered Wildlife
Program, N.H. Fish and Game

New Hampshire has fewer types of reptiles and amphibians compared to states further south, largely because of long, harsh, northern winters that many species cannot tolerate. The species that do call the Granite State home have amazing adaptations to survive such conditions.

Reptiles and amphibians are commonly referred to as “cold-blooded” organisms, meaning their body temperature and, as a result, their activity changes with the surrounding environment. As warm, humid summer months transition to the cool nights of early fall, reptiles and amphibians begin to seek shelter for the winter months, when activity generally stops. Most of our native snakes and some salamanders and frogs hibernate terrestrially, seeking shelter underground in mammal burrows, rotting logs, leaf litter and stone walls. Turtles and many frogs seek wetlands, ponds, lakes or rivers in which to spend the winter. Although respiration is slowed during winter months, amphibians and some reptiles have some ability to breathe

through their skin, allowing these individuals to stay submerged in cold, oxygenated water.

For wood frogs, portions of their bodies may actually freeze, but a transformation of glycogen to glucose in the body acts as a natural antifreeze, preventing ice crystals from forming within critical body cells.

For other species, a lack of adequate sites in which to safely spend the winter may limit populations from expanding into new areas. The timber rattlesnake, an endangered snake in New Hampshire, relies on communal rocky den sites where snakes may spend over seven months below the frost line in a suspended state of inactivity. For reptiles and amphibians, extended inactivity followed by a demanding, time-sensitive activity period is the only effective strategy for surviving in our state.



Wood frogs recovered during winter appear to be frozen solid. When warmed, they start jumping because of their amazing ability to pack their blood and cells full of glucose that acts like antifreeze.



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Lakes Ice Over

When people haul up their docks and boats and close up their lake cottages every fall in preparation for the winter months, the full-time in-lake “residents” also prepare for the long, cold months ahead.

In the fall, solar energy to the lake from the sun is reduced and the upper layer of the water column cools. Each lake cools at a different rate, with smaller, shallower lakes cooling more quickly than large, deep lakes. As water cools, its molecules move more slowly and come closer together, increasing its density. This cooler, denser water tends to sink toward the lake bottom. The sinking, combined with wind action, causes the mixing of the upper and bottom layers of the water column. Known as fall turnover, this mixing typically happens during the months of October and November and causes a

uniform temperature and an even distribution of nutrients throughout the water column.

By the end of November, many New Hampshire lakes reach their maximum density of 1.000 at 39° F (4° C). The coldest water temperatures (1° to 3° C) cover the top of the lake. A lake usually freezes over with its first permanent ice layer on a cold, calm night. When ice forms the water molecules slow down and spread out in a lattice-like pattern, increasing the distance between the individual molecules. The result is the ice is less dense (.9168) than the cold water around it, a phenomenon that causes ice to float on the surface. In this position, it acts as an insulator and prevents the water below from freezing, enabling aquatic organisms to survive through the winter.

Luckily for the plants and the animals that exist in New Hampshire lakes, water has a high specific heat. This is a physical attribute that causes lakes and ponds to go through gradual temperature changes, providing plants and animals time to adapt to seasonal changes. If it were not for these unique properties of water (its high specific heat and the density differences that exist between ice and cold water), imagine what would happen to lake life if a late August night is below freezing – you might awaken to a lake that had frozen solid in one night!

Adapted from articles by Jody Connor, N.H. Department of Environmental Services, and from the Vermont Department of Environmental Conservation's Out of the Blue.



WEB

Life under the Ice - Finding Winter Fish

by Mark Beauchesne
New Hampshire Fish and Game
Let's Go Fishing Program Coordinator

Throughout the winter, you can find New Hampshire residents and visitors fishing on our lakes and rivers. To be successful at ice-fishing, you need to know where to find the fish once the winter cold and ice set in. To do that, you need to understand some basic principles of winter fish ecology and aquatic ecology.

Cold water holds more oxygen than warm water. Therefore, as the temperature goes down, the oxygen levels go up. In the winter, the water temperatures are quite cold. In fact, the temperature from the top of a lake to the bottom may only vary by 4° C. The ice on top will be 0° C and the temperature on the bottom will be 4° C.

In New Hampshire, fish can be divided into warmwater and coldwater species. Warmwater fish, such as yellow perch, black bass, chain pickerel, bullheads and sunfish, prefer to live in water that exceeds 70° F in summer. These species are more tolerant to lower levels of dissolved oxygen than coldwater fish. In the winter, these species tend to slow down, although you can still catch them under the ice. They are usually found close to the bottom because the water is slightly warmer there.

Coldwater fish are also known as "oxygen loving fish" and prefer to live in waters where summer temperatures do not exceed 70° F. All of New Hampshire's trout and salmon are coldwater fish and need a higher concentration of dissolved oxygen to survive. In the winter, they can be found throughout the water column because the cold temperature provides good oxygen levels throughout the lake or pond.

Where light penetrates the ice, aquatic plants photosynthesize. These areas can attract warmwater fish because the plants provide a steady amount of dissolved oxygen and shelter. When a heavy amount of snow accumulates on the ice, the amount of light penetrating through is reduced. With less light, aquatic plants may die and be broken down by bacteria. These bacteria use oxygen and can cause a dramatic drop in dissolved oxygen. Sometimes in shallow bodies of water

(35-40 foot maximum depth), this can cause what's known as a fish kill. The coldwater fish are the most vulnerable if this occurs and may suffocate because of the lack of oxygen.

N.H. Fish and Game's Let's Go Fishing Program offers hands-on ice-fishing workshops to help students learn about winter fish and pond ecology. The workshop is a great way to experience winter ecology in New Hampshire. For more information, visit

www.wildlife.state.nh.us/Fishing/letsgefishing.htm.

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Activities Related to Articles in This Issue

Project Learning Tree suggests:

In autumn, leaves of many trees turn color and fall to the ground, many animals migrate or go into hibernation, the days get shorter and the air gets cold. *Signs of Fall* explores this pattern, which repeats itself every year.

Adopt a Tree encourages students' awareness of individual trees over time, as well as incorporating various other subjects. By adopting individual trees, students gain a greater awareness and appreciation of their local environment.

Rainfall, sunlight and temperature are important factors influencing where plants can grow and, in turn, where animals can live. In *Rain Reasons*, students

design experiments to see how these climatic factors influence the growth and lives of plants.

Project WILD suggests:

By making plaster casts of various wildlife tracks in the activity *Tracks!*, students gain the skills they need to help them identify wildlife tracks they may find in the snow. Tracks provide evidence of what wildlife is out and about in winter.

In the activity *Stormy Weather*, students go on a simulated field trip to experience a winter blizzard. Students imagine themselves in the place of both domestic and wild animals while the simulated "storm" rages around them.

In *My Kingdom for a Shelter*, students

learn about the shelter needs of a variety of wildlife and create a model of a type of wildlife shelter.

Project WET suggests:

In *Imagine*, students take an imaginary journey along with water in its solid, liquid and gaseous forms.

Adventures in Density uses science and literature to help students understand the changes in density that result in the different states of water.

The activity, *Piece it Together*, analyzes and plots global temperature and precipitation distributions to determine climate patterns and how they influence human lifestyles.

ANNOUNCEMENTS

N.H. Fourth Grade Water Science Fair

The N.H. Drinking Water Week Coalition will be sponsoring the N.H. Fourth Grade Science Fair competition during National Drinking Water Week (April 30 – May 6, 2006). The fair is the culmination of local water science fairs held at schools around the state. The top three student projects from participating schools are invited to compete at the state finals, to be held on May 3 in Keene. Prizes are awarded to the most outstanding projects. Any fourth grade teacher interested in having his/her class participate should contact Jessica Brock at (603) 271-4071 to receive a water science fair participant manual.

Change a Light, Change the World Campaign

The ENERGY STAR “Change a Light, Change the World” campaign is a national challenge to encourage every American to help change the world, one light, one step at a time. If every U.S. household changed just one light to an ENERGY STAR-qualified one, we’d collectively save more than 35 billion pounds of greenhouse gas emissions. That’s the environmental equivalent of taking one million cars off the road.

Visit www.energystar.gov/changealight to find out more about the campaign and:

- Use “Change a Light Change the World” as a classroom exercise by having students “take the pledge” to change a light.
- Encourage your students and their families to change one light bulb to an energy-efficient compact fluorescent bulb.
- Provide encouragement for improving your school’s energy usage.

The national campaign runs from October 1 – November 30. For more information, contact Kathy Brockett at N.H. Department of Environmental Services Air Resources Division, (603) 271-6284, or e-mail kbrockett@des.state.nh.us.

Exploring Environmental Issues Where We Live

Project Learning Tree has just released *Exploring Environmental Issues in the Places We Live*, a secondary module focused on active investigation of students’ communities. The curriculum provides opportunities for students to explore sense of place and investigate connections between social and economic changes and local environmental issues. Workshops focused on this module are

being held throughout the state. For more information about these materials, contact Beth Lesure at (603) 226-0160 or info@nhplt.org.

Earth & Sky Radio Show Connects to PLT Activities

EarthCare and the Earth & Sky Radio Show feature short informational stories about endangered animals, the climate, forests, the atmosphere, oceans, conservation and many other environmental topics. The site lists Project Learning Tree activities teachers can use to further student exploration of these topics. Transcripts for each show provide ideas for book reports and other projects and can help develop reading comprehension skills while sparking an interest in science. EarthCare and the Earth & Sky Radio Program are available at www.earthsky.org.

Resource Guide for *A Walk in the Forest*

Project Learning Tree has just republished the *Resource Guide for Conducting A Walk in the Forest*, a booklet that contains activities and resources for preparing to take students outdoors. The guide incorporates a comprehensive list of contact information for Tree Farmers and professional foresters in New Hampshire who are ready, willing and able to assist teachers in investigating their local natural areas. To obtain a copy of the Resource Guide, contact Beth Lesure at (603) 226-0160 or email info@nhplt.org. The guide is also available online at www.nhplt.org/community_connections.htm.

Below Zero Is Coming to New Hampshire

Be among the first educators in the state to participate in a *Below Zero* workshop on Thursday, December 8, from 4:00 – 8:00 p.m. at N.H. Fish and Game headquarters, 11 Hazen Drive, Concord. *Below Zero* is an interdisciplinary, supplementary education

program about the environment and wildlife in winter created by the Canadian Wildlife Federation. It is based on the Project WILD model, with K-12 instructional activities designed for easy integration into a variety of school subject areas. Cost of \$25 includes supper and the *Below Zero* manual. Contact Mary Goodyear at mgoody@ncia.net or (603) 846-5108 for more information and to register.

Flying WILD: Learn about Birds

If you want to include more about birds in your classroom, Flying WILD may be just for you. The new interdisciplinary, supplementary education program about birds is based on the Project WILD activity model, with K-12 instructional activities designed for integration into various subject areas. The manual includes a guide for hosting bird festivals at your school. Workshop will be held February 2, from 4:00–8:00 p.m. at Prescott Farm Audubon Center in Laconia. Cost of \$25 includes manual and dinner. For more information and to register, contact Mary Goodyear, N.H. Fish and Game, at mgoody@ncia.net or at (603) 846-5108.

Action Grants Available

Got a schoolyard habitat project? Then apply for a “Homes for Wildlife Action Grant,” funded by the Conservation License Plates through the Nongame and Endangered Wildlife Program of the N.H. Fish and Game Department. This program provides \$300-\$600 grants to help initiate habitat projects. Qualifying projects will 1) directly benefit wildlife, 2) involve students in planning and implementation, 3) make connections with your curriculum and 4) be sustainable for the long term. Grant deadlines are November 15, 2005, and February 15, 2006. Contact: Marilyn Wyzga, Project HOME coordinator, at (603) 271-3211 or mwyzga@wildlife.state.nh.us.

RESOURCES AND WEB CONNECTIONS

- NH Department of Environmental Services Climate Change Resources for Educators www.des.nh.gov/ard/climatechange/teachers.htm
- Mount Washington Observatory: Normals, Means and Extremes www.mountwashington.org/weather/normals.html
- Marchand, Peter J., *Life in the Cold: An Introduction to Winter Ecology*, University Press of New England, Hanover, N.H., 1996.

ON THE H.O.M.E. FRONT

Winter Ecology of the Schoolyard Habitat

by Marilyn Wyzga



The bright red fruits of highbush cranberry persist through winter and fuel the spring migrations of songbirds.

Your schoolyard is a home for wildlife, a landscape of plant communities and an outdoor classroom waiting to be claimed. Here in New Hampshire, where winter settles upon us for five months of the year, you'll do best to consider the challenges of this season on all those aspects when developing and using a schoolyard habitat.

Get Ready: Planning and Design

Think snow. If you've just begun to develop your schoolyard wildlife habitat, plan ahead for the demands of winter weather. Snow comes down and gets moved around. Where will the plows push the piles? Which plants can handle snow load? How will parking lot salt stress the plants?

Trees and shrubs with flexible limbs can bend under snow, like green ash (*Fraxinus pennsylvanica*) and Shubert cherry (*Prunus virginiana* "Shubert"). Some with soft needles, like eastern hemlock (*Tsuga canadensis*), easily shed lighter snow, and others with stiff needles, like many junipers, bear up to snow. Look for plants that tolerate salt among those that grow along the salty coast, such as bearberry (*Arctostaphylos uva ursi*) and bayberry (*Myrica pensylvanica*).

Wildlife is out there in the snow. Think like an animal: what would you need to survive the long cold nights and the short dark days? Food and cover go a long way toward survival. Include in your plan persistent winter fruits like highbush cranberry (*Viburnum trilobum*), inkberry (*Ilex glabra*), staghorn sumac (*Rhus typhina*) and

pasture rose (*Rosa carolina*), and winter cover plants like white pine (*Pinus strobus*), eastern red-cedar (*Juniperus virginiana*), and mountain laurel (*Kalmia latifolia*). Leave dead trees and fallen logs; wildlife can take cover in their cavities for protection from snowstorms.

Choose plants for our zone, which ranges from Zone 3 (up north) to 5 (south and coast), so they will have a better chance of surviving our New Hampshire climate. Also carefully consider placement of your plants; sun exposure and moisture will influence growing success.

To create "winter interest," choose wildlife beneficial plants with interesting branching patterns and bark, such as river birch (*Betula nigra*), downy serviceberry (*Amelanchier arborea*) and common ninebark (*Physocarpus opulifolius*). For water in your winter landscape, use a heater in your birdbath, paint the bottom of it black, or refill it daily with hot water.

Put It to Bed: Maintenance

It's easier to establish a schoolyard habitat than to keep it growing. To get a head start on maintenance, only plant and build what you have the time and energy to maintain. Assemble a maintenance schedule so you're prepared to put your schoolyard habitat to bed in a way that will improve survival for the next spring – that is, making

sure it will wake up! Your task list might include: Cover your pond with netting to keep excess leaves out. Remove the pump from the pond. Cut annual weeds, rather than pulling them out (their roots will die and nourish the soil, and you avoid stirring up more weed seeds). Remove leaves from the beds, run them over with a mower and replace them as mulch.

For wildlife, start filling birdfeeders at the beginning of November to supplement wild food sources and keep them filled and cleaned throughout the winter. Leave meadow flowers and grasses standing – so their seed heads can satisfy hungry birds and their stalks can provide winter interest – and mow them after migrating birds have returned in spring.

Fall is a good time to clean out nesting boxes, to make them ready for new residents as soon as birds arrive in the spring. You can put new nest boxes up in late winter. This is also the time to plan for new plantings and order seeds and trees.

Schoolyard Study in Winter

Teaching with the seasons is called "phenology." Students can learn about local flora and fauna, track the weather and closely monitor the progression of winter; this yields important data in the inventory of your schoolyard habitat site. Tracks, visible in the



Leave meadow flowers and grasses standing; stalks create winter interest poking through the snow, and birds will continue to eat the seeds.

HOME continued from page 7

snow, give clues about resident wildlife and their habits. Woodland structure is more apparent when the leaves are off. You can

find insect evidence on bark and twigs, and find nests on high branches.

You might assemble a phenological calendar of study like this one from Minnesota science teacher, Larry Weber, (author of *Backyard Almanac: A 365-day guide to the plants and critters that live in your backyard*.) Novem-

ber, "The Cloudy Freeze-Up Month": non-flowering plants; animal signs; animal tracks. December, "The Dark Month": large mammals; winter birds; natural lights. January, "The Cold Month": wildlife in winter weather; pond in winter; conifers. February, "The Dry Month": humans in winter weather; winter wildflowers; decidu-

ous trees in winter.

Remember that, while always rewarding, studying outdoors is not without its difficulties. Students may not always come prepared for weather conditions, and their energy levels outdoors can be taxing. Maintain a semblance of classroom structure. Take classes out regularly from the beginning of the school year to help establish a routine. And, as in the indoor classroom, be sure they know the code of conduct for how to treat each other and the organisms they find.

Winter presents challenges as well as wonderful opportunities for the schoolyard habitat. As one Minnesota teacher commented, "I figure winter is about half our year, so we better find a way to make the most of it."

For more information on salt tolerant and winter hardy native plants, contact Marilyn Wyzga, Project HOME coordinator, at (603) 271-3211, mwyzga@wildlife.state.nh.us, or the New England Wild Flower Society, Framingham, MA, www.newfs.org.



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